COTS/ONR Workshop

On November 16-17, 2004 a workshop was held in Charleston, SC for recipients of the Coastal Observation Technology System (COTS) and Office of Naval Research (ONR) coastal and ocean observing awards as well as representatives from each of the nascent Regional Associations (RAs). The primary goals for the workshop were to 1) Enhance the coordination, especially data integration, among recipients and other collaborators; 2) Review guidance for FY05 proposal preparation; 3) Discuss the strategic outlook for COTS/ONR partners and an Integrated Ocean Observing System (IOOS).

November 16, 2004 (Day 1)

IOOS landscape

(Margaret Davidson, NOAA Coastal Services Center) - *Charge to the group is to create a successful demonstration of data integration among coastal ocean observing systems within and across regions and with the national backbone. Workshop participants urged to consider when and what this demonstration will be.*

- What can be accomplished over next year or two?
- Need to demonstrate concrete visualization of value from an Integrated Ocean Observing System (IOOS); need to come together to make happen
- This group can bring the U.S. Commission on Ocean Policy (USCOP) charge to life.
- FY06 is window of opportunity

(Mel Briscoe, Office of Naval Research)

- COTS and ONR partners need to weigh in with their comments for the second Annual IOOS Development Plan
- Envision a Coastal Channel or the Weather Channel with the "national display" of ocean observations to show the power of integration of data. Need integration, coordination within group to make this happen

(Lee Dantzler, Ocean.US)

- Implement and sustain IOOS – top priority for The National Oceanographic Partnership Program (NOPP) 10 year plan
- USCOP strongly endorses IOOS. Implement commission objectives
- Ocean.US wants Regional Associations (RAs) to pull together the observing elements and requirements.
- As we work toward integration, common standards, observe the "do no harm" rule to existing systems.
- National Federation of Regional Associations (NFRA) – set up to be the honest broker in interface, including $ for the communication of feds to non-feds.
- Pilot priorities:
  - surface currents
  - topo-bathy
  - coastal Global Ocean Data Assimilation Experiment (GODAE)

(Paul Scholz, NOAA Coastal Services Center)

- Eventually money flow would go through RAs
- RAs need to be administratively nimble

- RAs role as data assembly center

ONR funding view
(Mel Briscoe, Office of Naval Research)

1. Discretionary core funds
   - ocean, atmosphere, and space
   - science and technology funds but not RA or operational obs systems in US
2. Congressional interest items
   - not new $; from elsewhere in ONR
3. NOPP - maintained in navy budget
   - stable in budget; supported by secretary
   - "enablers" of the system
   - coastal wiki network for communication
   - GODAE
   - NOPP program officer at Consortium for Oceanographic Research and Education (CORE) runs announcement and review process
   - Process works well for research projects, not so well for operational needs or capital equipment. NOPP is enabling, not sustaining
   - autonomous underwater vehicles (AUVs are big ONR investment

- Operational Navy not interested in investing in US coastal zone observing activities
- Big difficulty: how to coalesce multiply monies into multiple institutions
- In budget language – would like to see states match funds for projects

Data management – the Data Management and Communications Plan (DMAC)
(Lee Dantzler, Ocean.US)
Presentation available at: www.csc.noaa.gov/cots/workshop.htm

- Coherent strategy needed to integrate data streams
- Technology not an insurmountable barrier
- Principal challenge is coordination
- Standards will vary – there is not one standard
- The Open source Project for a Network Data Access Protocol (OpenDAP), network Common Data Form (NetCDF), Climate Common Data Language (CDL) need sustained agency support

1. Establish sustainable, community-based IOOS standards evolution process
2. Immediate steps
   - machine to machine interoperability
   - metadata
   - data discovery
   - Quality assurance and quality control (QA/QC)

<u>DMAC Process</u>

- Ocean.US DMAC steering team underway
- Standards – specific technical working groups (ex. metadata)
- Federal inter-agency IOOS implementation

<u>Pressing needs</u>

1. Consistent IOOS-wide descriptions of data (metadata)
   - vocabulary

- content

2. Ability to search and find data/information
   - Federal Geographic Data Committee (FGDC) clearing house (minimum)
   - Other?
3. Ability to access/retrieve data and information
4. Ability for users to evaluate character of data using common browsers
5. Secure responsive long term data storage (archival)
6. Best practices, if not standards. Adequate standards even OK
7. Template for basic data sets (everyone doing this independently)

What should COTS partners do?

1. Publish data in a consistent manner so it can be discovered, retrieved or extracted and transported by/to the user on machine to machine interoperable basis
2. Common approaches for publishing data and metadata
3. Tasks to achieve this should be taken on by this group

- The immediate steps to be taken (metadata, data archive, etc) can and should be taken now
- Audience concern: "We're going to come up with an answer and you're going to come down the road and tell us we need to change our standards." Dantzler: "Don't wait for answer." Is there a consistent regional approach and does that approach meet standards? Expect changes. Recommendation at US Global Ocean Observing System (GOOS) meeting: provide web-accessible list of current needs
- Need to look around at what is available and has expandability to other regions
- Need some consistency in data distribution (some users operate on modems; glitzy not necessarily better)
- A goal in future is to make data flow from sensor to users in an automated fashion
- Need to be engaging private sector as much as possible to develop products
- Need to implement community approach and define the next steps
  - Leverage each others expertise and move forward. If someone has already done something (ex. Seacoos design to use opendap), don't do it yourself. Many things have been done (metadata initiatives); need to take next steps.

Data management, QC, and distribution
(Jim Boyd, NOAA Coastal Services Center)
Presentation available at: www.csc.noaa.gov/cots/workshop.htm

- Celebrate our accomplishments
- Where are common data being collected?
- Highlight where we have worked together:
  - Data flow to federal systems
  - Interoperability demonstration (SST)
  - Interoperability demonstration (hurricane version)
  - Regional data (integrated) output (SouthEast Atlantic Coastal Ocean Observing System (SEACOOS) water level input/output).

Audience questions/concerns:

- Can we provide some synthesis of data and some value added feedback to providers? For example: where we are identifying common format use?

- Different project websites can have individuality, but there needs to be more consistency (in way stored, metadata, format etc) when you actually get to the data.
- There are commonalities among different data sharing mechanisms for all the projects. CSC will look closer at the data distribution methods (filled out by participants) and share with group.

NOAA/COTS Enterprise QA/QC
(Steve Collins, NOAA National Data Buoy Center)
Presentation available at: www.csc.noaa.gov/cots/workshop.htm

- Data Assembly Center (DAC) roles
  - Assembly and distribution
  - QA/QC for meteorological and oceanographic data
- Meteorological and Oceanographic Data Exchange Module (MODEM) kit – used to transfer data
- FY05 Plans
  - Serve all data w/OPeNDAP (and web)
  - More COTS using MODEM
  - Prototype Live Access Server (LAS)
  - Standardize QA/QC for selected ocean parameters
  - Improve metadata collection and sharing

Audience questions/concerns:
- Need to reassemble project parameter table (many parameters not listed, some redundant ie. conductivity and salinity). Differentiate between systematic, real time data and variables that are collected infrequently such as chlorophyll. (table in preliminary form; mostly intended for illustrative purposes)
- Modem software toolkit is a fairly low-tech mechanism for moving things around. Need to start thinking beyond just sending data through modem kit.
- How do we define a working group and work with NDBC?
- Co-OPS interested in short term observational data if they do not currently have data in that area. Documentation and standardization needs to be improved.

(Steve Gill, NOAA Center for Operational Oceanographic Products)
Presentation available at: www.csc.noaa.gov/cots/workshop.htm

- Provide operational data and products for National Water Level Observation Network
- Map-coast interface for real time data from federal sources
- List of some data QA/QC and processing Center for Operational Oceanographic Products (CO-OPS) performs for water level data:
  - QC
  - Monthly processing
  - Datum computation
  - Harmonic analyses
  - Tide prediction
  - archival

Audience questions/concerns:
- Map-coast interface for real-time data from all federal sources. HF radar is of interest for NDBC nearshore

- QA/QC should not be viewed as a one-way road (with NDBC and CO-OPS) Within regions people looking at data together and may see problems with NDBC and CO-OPS data
- Need to figure out next steps, role of NDBC, CO-OPS, etc. Multiple NOAA entry points for data is a challenge
- Break up into different regions and publish facilities for wave calibration, etc. If any equipment is out there, need list, provide standards needed
- COTS partners should work with RAs on Business Plan – not separately.
- Is there a way to post all National Environmental Policy Act (NEPA) language somewhere central? Categorical exclusions: would like to see it done on pieces of equipment (as opposed to the project)

Data management & integration
(Jim Nelson, SEACOOS)
Presentation available at: www.csc.noaa.gov/cots/workshop.htm

- SEACOOS as example of role of Regional Coastal Ocean Observing System (RCOOS) data aggregation and display
  - Providing real time observations
  - Coordinating model simulations for southeast region
  - Data management (data provider protocols, data aggregation and display methods, data dissemination)
- Lessons learned: demonstrated interoperability at cost of thoroughness
- Other activities:
  - coordination with NDBC, NWS
  - coordination with RAs - Southeast Coastal Ocean Observations Regional Association (SECOORA)
  - Development of metadata tool for RCOOS (metaDoor)
  - Coordination with state agencies

Audience questions/concerns:
- SEACOOS emulating a data assembly center – is this a role for RAs? Aggregated data and data products can be distributed through RAs - Lee Dantzler (Ocean.US) sees this as a natural progression.
- RAs need to think about new equipment in the water, data sources. Need to aggregate the data to some extent to use GIS tools. Data dictionary is an excellent concept.
- DMAC plan advocates a distributed approach.
  - Can have bottle necks and can be overly distributed
  - RAs may provide just the right amount between centralized and being overly distributed
- How do you know when you have the right size for an RA (SEACOOS seems to cover a large area). SEACOOS integrates individual projects (monitoring, info and management, and outreach efforts). Activities vary by scale (type and geographic). Modeling component: difficult to answer if RA is at the right scale – depends on question.

(Russ Beard, NOAA National Coastal Data Development Center - NCDDC)
Presentation available at: www.csc.noaa.gov/cots/workshop.htm

- NCDDC role – support of IOOS DMAC subsystem. NCDDC can provide support in the following categories:

- Metadata management
- Data discovery
- Data transport
- Online browsing and visualization
- Data archive and access
- Interoperability

- NCDDC Capabilities – some of the tools and services that NCDDC can provide
  - GIS mapping
  - Marine Environmental Resource Mapping and Information Database (MERMAID)
  - Collaborative web tools
  - Data entry tools
  - Data discovery
  - Data access
  - Data aggregation
  - Process-driven metadata

- Future Directions – plans to improve interoperability and issues needing further development
  - Open GIS Consortium (OGC) w/commercial map services
  - OPeNDAP
  - Live access server
  - Process driven metadata
  - Vocabulary mapping

Day 1 Recap *- A key outcome of the workshop was the consensus among participants to create a successful demonstration of data integration among coastal ocean observing systems within and across regions and with the national backbone. The following is a list of topics that the audience felt needs to be addressed to work toward a data integration demonstration:*

- Time is now (to demonstrate interoperability)
- Need working groups to tackle key issues.; come up with list of names for subgroups
- Need communication strategy, talk about best practices, share successes, etc
- Need to get private sector involved in product development (RAs especially)
- What are liability issues for providing operational data?
- Vision of weather channel, coastal channel – what are steps to make that happen?
- Identify demonstrations that we need to do as a group – first interoperability demonstration was useful but fire drills not way to develop operational system

Equipment – *participants feel that equipment and sensors must be performing regularly and correctly. The following is a list of recommendations related to equipment needs.*

- performance standards for sensors
- sensor calibration service/facility

Data Management – *some of the specific concerns the group had related to data management and integration issues.*

- Review and comment on DMAC plan – be part of solution
- Best (adequate) practices – do it and document it
- Marine metadata initiative – this group needs to be involved
- Small steps: getting data dictionary down, data structures down; QA, QC algorithms
- Templates for data structure and retrieval. Need consistency on our web sites, common interface

- Data from national providers not always accessible
- What is role of regions as data assembly centers?
- Data commons – need agreement for interoperability

Working with NOAA – *some of the audience's concerns about interfacing with various NOAA offices on data management and integration:*

- Issue of multiple data entry points (NDBC, CO-OPS, NCDDC, others?)
- NDBC Modem kit vs. other data transport processes
- COTS data matrix – CSC to update with input from projects, include pilots, map to IOOS core variables

November 17, 2004 (Day 2)

Coastal Services Center's (CSC) priorities – *topics that Coastal Services Center identified as high priority for COTS/ONR partners*
(Margaret Davidson, NOAA Coastal Services Center)

- Data integration
  - Integrated product line across regions
- Template, common interface – image of coherence
- Community modeling (w/CSC)
  - storm surge
  - deliver something that rotary club would care about

Data management – national integration
(Phil Bogden, Gulf of Maine Ocean Observing System)
Presentation available at: www.csc.noaa.gov/cots/workshop.htm

- Few examples of different data providers and the different data transport/sharing methods they use:
  - World Wide Web (WWW) → Hyper Text Transfer Protocol (HTTP) & Hyper Text Markup Language (HTML)
  - Climate Models → OPeNDAP + Climate and Forest (CF)/Cooperative Ocean/Atmosphere Research Data System (COARDS)
  - Ocean Biogeographic Information Systems (OBIS) → Distributed Generic Information Retrieval (DiGIR) + Darwin Core II
  - Environmental Protection Agency (EPA) → EXtensible Markup Language (XML) + Schema
  - National Weather Service (NWS) → XML + Really Simple Syndication (RSS)
  - DMAC → OPeNDAP + ??? (SEACOOS Common Data Language)

- SEACOOS used extension of climate model: CDL (Common Data Language) and has published this information.
- Region can leverage expertise of small group. Need best practices. Put in writing a Beginner's Guide to putting out data. Not everyone has to learn each data transfer software type. For example biologists may use OBIS, CODAR people may use CF/CDL
- The point is one size does not fit all, but a system of systems relies on knitting together the different processes

Audience questions/concerns:

- How to go between ArcIMS and OPeNDAP? Sometimes we need to move data (or parts of data) around.
- Misconception about Open Geospatial Consortium (OGC) is that it is all about maps and not data. There is a whole part of OGC that is about moving data around.
- Sara Haines (sara_haines@unc.edu) is good person to contact for SEACOOS CDL/data document and technical questions
- CSC is looking for partners to test data transfer methodologies and metrics - contact Dave Eslinger (Dave.Eslinger@noaa.gov) or John Ulmer (John.Ulmer@noaa.gov)
- Functionality of mapping portals – Need to define. Mapping page can act as a portal to get actual data
- Many people still want data on CDs.
- Have to be able to provide data in multiple formats. Middleware provides translation from one format to another
- Many users do not have access to high-speed internet, high bandwidth – how do we involve these people? We must provide a variety of data access methods

Breakout sessions (workshop participants divided into three groups to discuss product demonstrations and steps to achieve)

Blue team (Mel Briscoe, Office of Naval Research, Facilitator & Melissa Ladd, CSC, recorder)

Product demonstrations:

1. Nowcasts of the ocean (wind/wave/water - 6 to 12 hour forecasts of these)
2. Radar surface currents plus data fusion for search and rescue

Five steps to achieve above demos:

1. Identify metadata system, common data language
2. Useful outputs for end users
3. Data aggregation/integration
4. Merge data for data products
5. Identify people, roles, partnerships, responsibilities, and resources

- Demonstration should have public value
- May have two sets of demos (one if weather channel is goal, one for funders)

Green team (Jim Boyd, CSC, facilitator and Rebecca Love, CSC, recorder)

The green group agreed that a future demonstration should be a regular product that is regional in scope with the following qualities:

- uniform look and common interface
- standards (ex. the SEACOOS template)
- address issues specific to regions
- RA integration and defining products
- Ability to link offshore components to inshore
- AVOID national “vanilla” demonstration
- Private industry involvement
- Model access standards, output format needs standards
- Connect managers, scientists, modelers on regional scale
- Address liability issues

Specific product demonstrations:

1. Rip tide warnings
2. Bar entrance warnings (ship traffic)
3. storm surge
4. water temperature climate trends for global ocean
5. upwelling
6. hazards
7. beach index

Yellow team (Dave Eslinger, CSC, facilitator and Anne Ball, CSC, recorder)
Ideas for product demonstrations:

1. current vectors around nation
2. openioos site – with a fisheries spin
3. storm impacts
4. weather channel idea at regional level

Steps to achieve above:

- Support and use Marine Metadata Initiative
- Strengthen communication
  - Need catalog service (where is the data, what stage are other projects in, lessons learned)
  - Identify best practices, how to share knowledge (list servers, Wikis, need to fund people to help with these issues)
- Need to establish working groups, give people tasks
- Task federal person to oversee working groups

<u>Synopsis of Breakout Group notes</u>

1. Routine product based on data being collected
   - nowcast or forecast
   - waves, currents, temperature, winds
2. Common page for national portal, common template for regional page
3. Customized regional products
4. National standards
5. Need high resolution digital elevation models, topobathy

Common themes among each group – *Consensus was reached to work on a demonstration product that would show integration among the projects, regions, and federal observing systems.* (Lee Dantzler, Ocean.US)

- Focus on regional nowcast for multiple regions
  - winds, surface currents, waves, sst
  - focused on search and rescue, hazards, recreation
- Short term – 6 month time frame
- Selected forecasts – what would those be?
- Involve private sector folks as we work through this
- Consistency in presentation - template at national level (region specific)

The "enablers" *– 5 priority areas for achieving the above integration demonstration in a 6 month timeframe. Working groups were formed to agree on a common approach for handling each topic and sharing this with the rest of the participants. Each group has 30 days to flesh out the particulars.*

1. Metadata
2. QA/QC for data observations as well as products
3. Data assembly/Aggregation (need a common approach for file structures and interface
4. Common Interface with specialized content
5. Communications facilitation
   - catalog resources
   - sharing expertise
   - defining roles, responsibilities, and resources

Working groups – *six working groups were created to address each of the priority areas listed above; an additional group was created to come up with a demonstration goal focus for a six month timeframe.* The name of each group's leader (s) is underlined

I Demonstration Goal Focus – *Target is a demonstration of successful integration within regions, across regions, and nationally involving the national backbone and costal/ocean observing systems. Workshop participants agreed to work towards a near real-time integrated "nowcast" demonstration of coastal (i.e., EEZ) conditions suitable for airing on the Weather Channel and/or local television stations in coastal states. This group has 30 days to flesh out the particulars.*

- Antonio Baptista, Oregon Health and Science University; email: baptista@ebs.ogi.edu
- Philip Bogden, GoMOOS; email: Bogden@gomoos.org
- Matt Howard, Texas A&M University; email: mkhoward@tamu.edu
- Julie Thomas, Scripps Institution of Oceanography; email: jot@splash.ucsd.edu
- Sandy Bernard, SECOORA; email: sandy.bernard@scseagrant.org

The following groups were formed to work on the priority areas ("enablers") to achieve the above integration demonstration goal in a 6-months timeframe.

II Metadata – *Reach agreement on metadata content, vocabulary, and actual production.*

- Anne Ball, NOAA Coastal Services Center; email: anne.ball@noaa.gov
- Julie Bosch, National Coastal Data Development Center; email: julie.bosch@noaa.gov
- Rob Bochenek, Exxon Valdez Trustee; email: rob_bochenek@evostc.state.ak.us
- Dwayne Porter, Baruch Institute; email: porter@sc.edu
- Stephanie Watson, CeNCOOS; email: swatson@mbari.org

III QA/QC – *Consistent approach on QA/QC for similar observations from multiple platforms, etc.*

- Elena Zagrai, Stevens Institute of Technology; email: ezagrai@stevens.edu
- Don Conlee, NOAA/NDBC; email: don.conlee@noaa.gov
- Steve Gill, NOAA/CO-OPS, email: Stephen.gill@noaa.gov
- Julie Thomas, Scripps Institution of Oceanography; email: jot@splash.ucsd.edu
- Ed Kearns, University of Miami; email: ekearns@rsmas.miami.edu

QA/QC Liability – *Get a more formal legal opinion on how to handle the liability shelter question*

- Josie Quintrell, GoMOOS; email: josie@gomoos.org
- Margaret Davidson, NOAA Coastal Services Center; email:Margaret.Davidson@noaa.gov

IV Data Assembly and Aggregation – *What needs to be done regarding common approaches on data publishing, access, retrieval, transport and integration*

- Dave Eslinger, NOAA Coastal Services Center; email: Dave.Eslinger@noaa.gov
- Leslie Rosenfeld, Naval Postgraduate School; email: lkrosenf@nps.edu
- Annette Schloss, University of New Hampshire; email: annette.schloss@unh.edu
- Vembu Subramanian, University of South Florida; email: vembu@marine.usf.edu
- Xiongping Zhang, Coastal Studies Institute; email: xzhangz@lsu.edu
- Eric Terrill, Scripps Institution of Oceanography; email: eterrill@ucsd.edu
- Kevin Kern, NOAA National Data Buoy Center; email: Kevin.Kern@noaa.gov

V Common Interface – *Move to a consistent web presentation at the national, regional and local levels. Present situation has each observing activity with different web site formats, etc. that creates no "IOOS brand recognition" and confuses the user from site to site*

- Lynn Leonard, University of NC – Wilmington; email: lynnl@uncw.edu
- Dale Robinson, CICORE; email: dhr@sfsu.edu)
- Donna McCaskill, NOAA Coastal Services Center; email: Donna.Mccaskill@noaa.gov
- Charlton Purvis, University of South Carolina; email: cpurvis@carocoops.org
- Mike Durako, University of NC – Wilmington; email: durakom@uncw.edu
- Christine Manninen, Great Lakes Commission; email: manninen@glc.org

VI Communication Facilitation – *Come up with and put in place effective mechanisms for sharing roles, responsibilities, functions, activities, lessons learned, best practices, contact lists, etc.*

- Jan Newton, University of Washington; email: newton@ocean.washington.edu
- Molly McCammon, Alaska Ocean Observing System; email: mccammon@aoos.org
- Janet Campbell, University of New Hampshire; email: janet.campbell@unh.edu
- Doug Wilson, NOAA OAR – Chesapeake Bay; email: doug.wilson@noaa.gov
- Joanne Bintz, Southeastern Universities Research Association; email: bintz@sura.org
- Geno Olmi, NOAA Coastal Services Center; email: geno.olmi@noaa.gov

General Needs/concerns – *The following is a list of needs and concerns that were repeatedly brought up throughout the workshop to further the IOOS***.**

- Private sector involvement
  - need guidance on how to engage private sector
  - concern w/favoritism.
- Output from workshop provides framework for implementing Ocean.US plan.
- COTS partners need to work with RAs
- Liability issues – need to sort out
  - What are liabilities for providing operational data?
  - What are standards for date quality and reliability for mission agencies?
- In order for RAs to move forward, they need money and participation at regional and national level.
- Data commons – need agreement for interoperability
- Not all projects need to be in next interop. Demonstration - some regions will have 80% of data, some will have 20%
- National map is dynamic, everyone can get motivated by national piece yet it has to be more than that map. Map can serve as the portal to each region. The region with the story to tell is one highlighted on weather channel – acts as incentive to work together.
- Where does commonality end and regional specificity start? Some regions will have different data types, sharing methods, etc